

NIST Teacher's Workshop

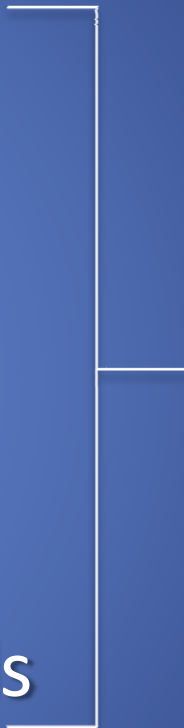
March 26, 2009



Atmospheric Pressure: A Measurable Force of Wind & Weather




Agenda

- What's in the air
 - Seeing skies and wind
 - Measuring pressure
 - Measuring wind
 - Historical Milestones
 - Drawing pressure and wind fields
- 

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- What's in the air
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Interactive
Activities for
the
Classroom

What's in the air ?

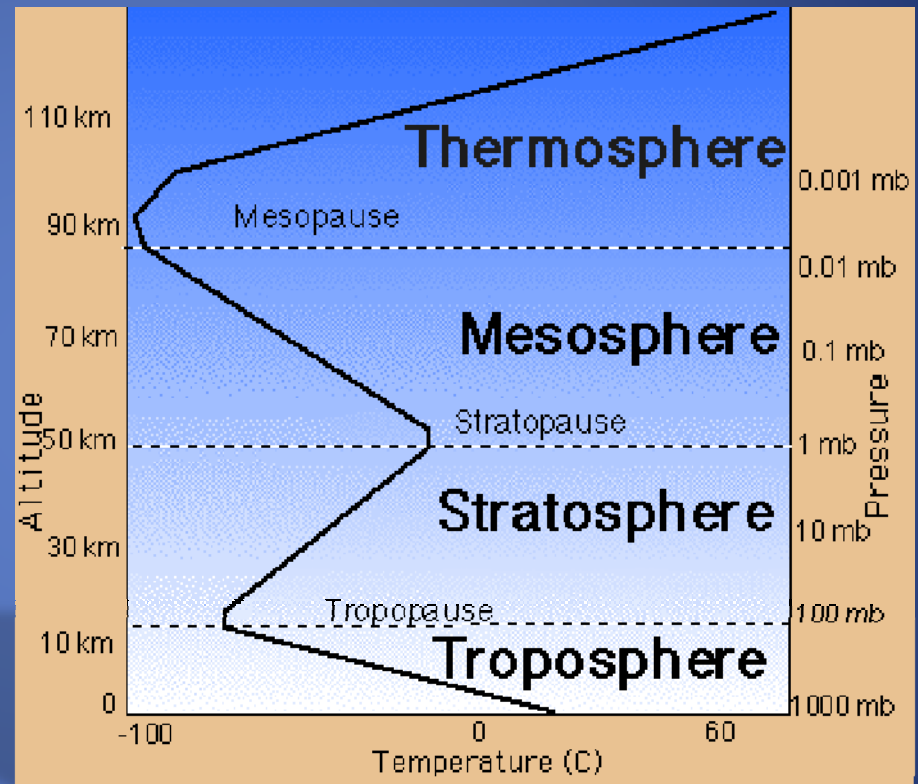
- Nitrogen (N_2)
- Oxygen (O_2)
- Water Vapor ($\text{H}_2\text{O}\uparrow$)
- Argon
- Neon
- Helium
- CO_2 , Methane, NO_2 , SO_2 , Ozone

% Volume

- Nitrogen (N_2) 78%
- Oxygen (O_2) 21%
- Water Vapor ($\text{H}_2\text{O}\uparrow$) 0-4%
- Argon <1%
- Neon
- Helium
- CO_2 , Methane, NO_2 , SO_2 , Ozone

Atmospheric Spheres of Influence

- Troposphere
- Stratosphere
- Ionosphere
- Mesosphere
- Thermosphere
- Exosphere



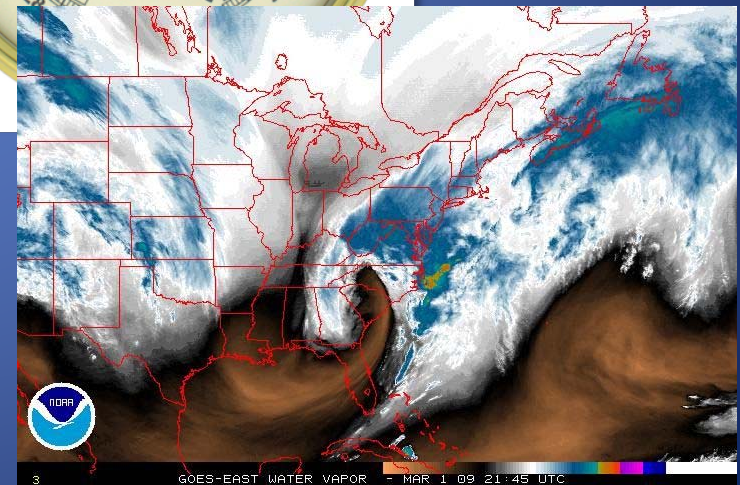
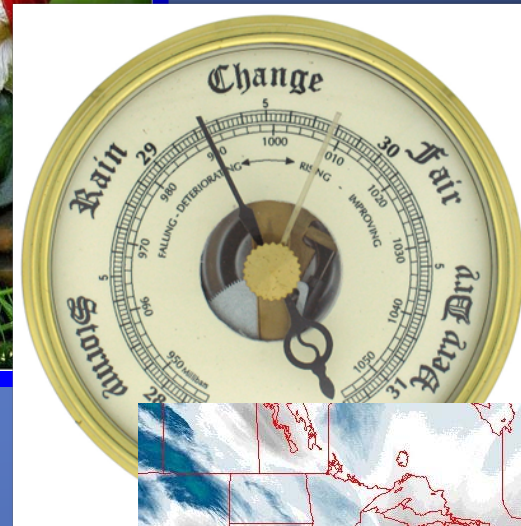
Measuring the Skies

- Thermometer
- Barometer
- Anemometer
- Wind Vane
- Psychrometer
- Ceilometer
- Radiometer



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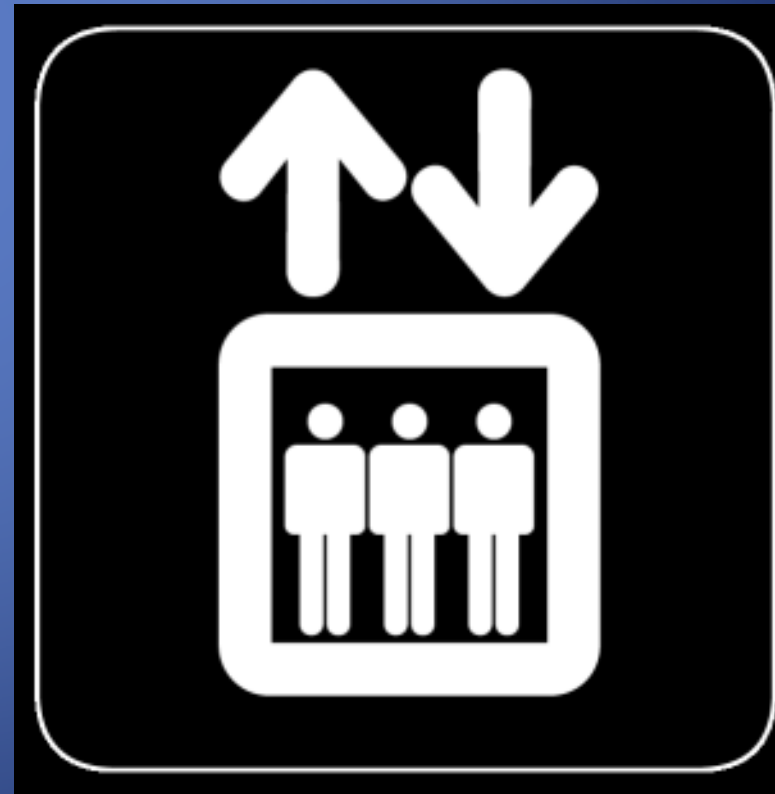
Sky Colors and Pressure Changes

- Is the sky one color?



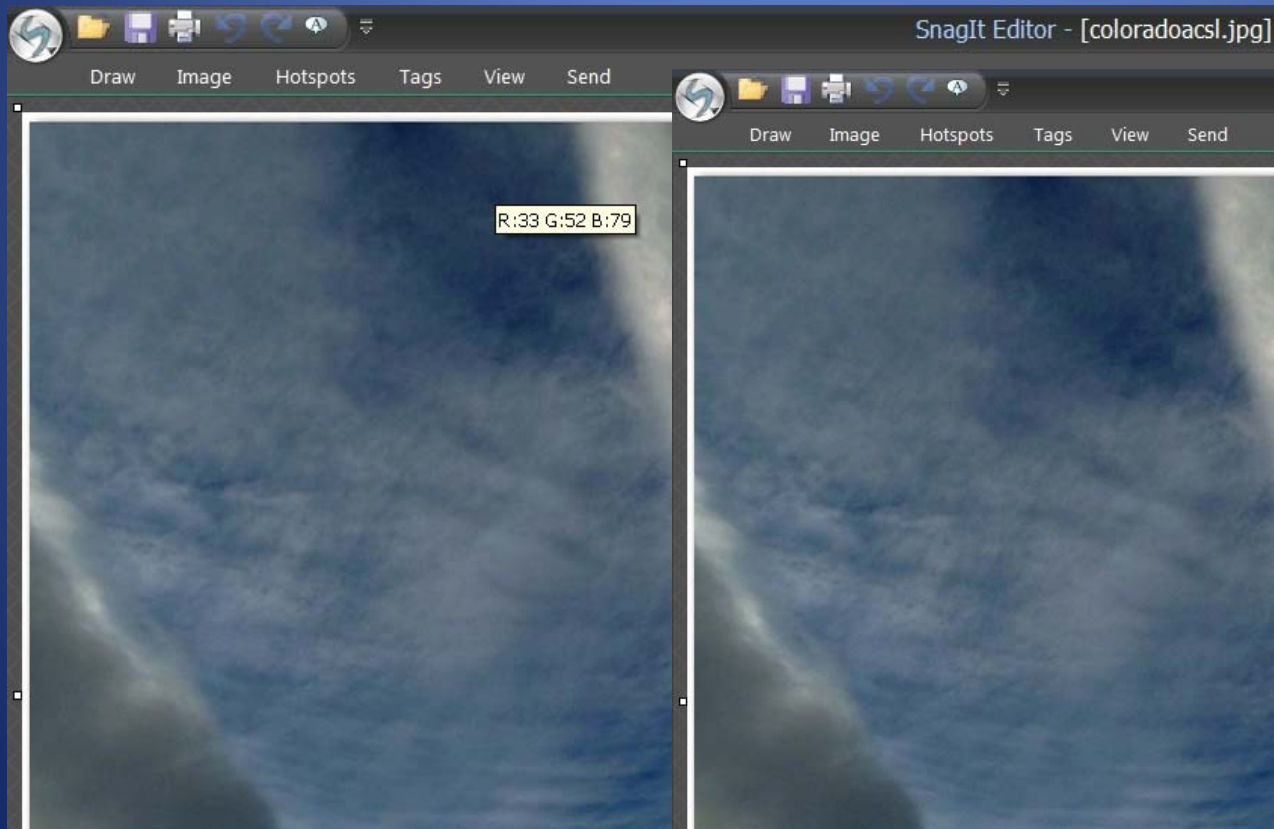
Sky Colors and Pressure Changes

- Is the sky one color?
- Does the weather change in an elevator?



Measuring Sky Color Differences

- ISO 120, ISO 200, ISO 400 (Analog)
- Red-Green- Blue Guns (Digital)



The Standard Atmosphere

- Defines values for atmospheric temperature, density, and pressure over a wide range of altitudes.
- The first model, based on an existing international standard, was published in 1958 by the U.S. Committee on Extension to the Standard Atmosphere, and was updated in 1962, 1966, and 1976.

Some Definitions

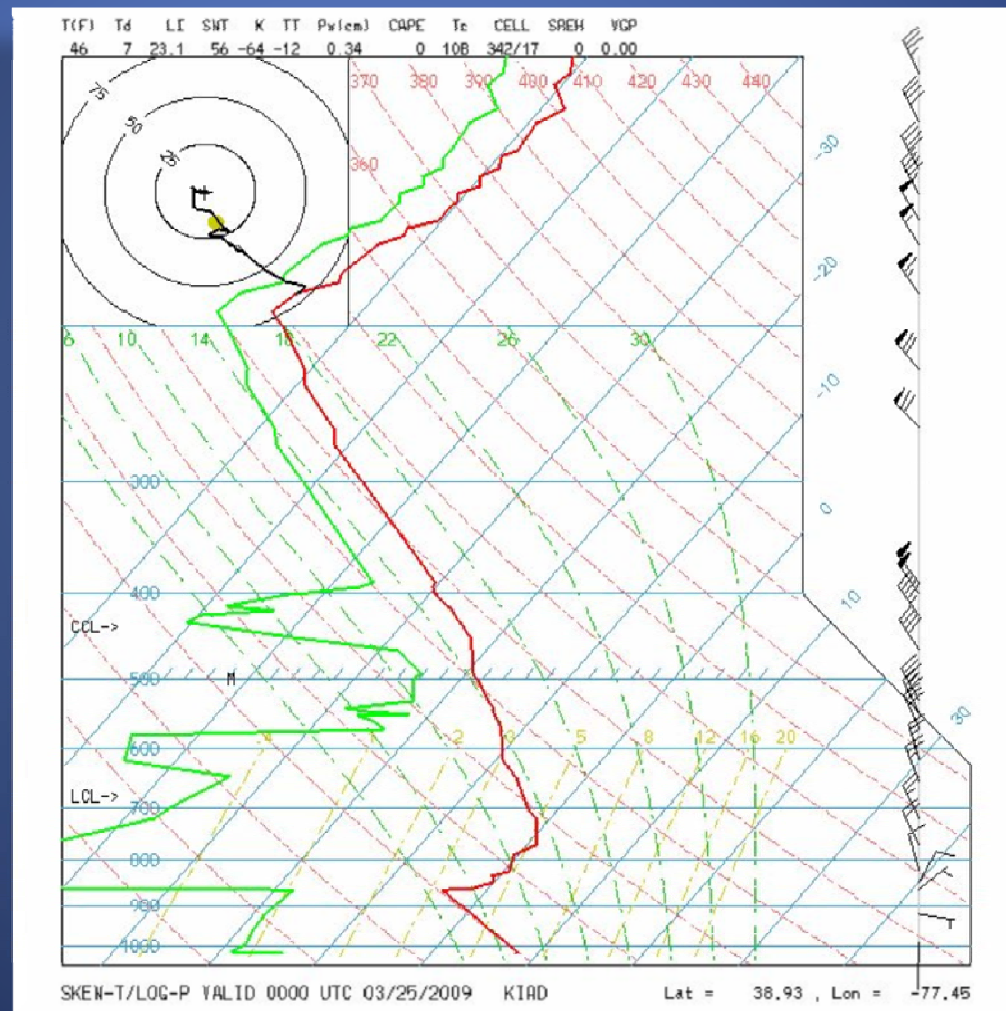
- **Wet Bulb Temperature:** The temperature a parcel of air would have if cooled at constant pressure, by evaporation, as water is evaporated into the air until it is saturated (100% RH).

Some Definitions

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- **Dew Point:** The temperature to which air must be cooled at constant pressure and water vapor content in order for saturation to occur

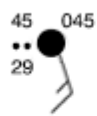
Radiosonde Measurements

- Weather Aloft

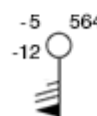


Surface & 500 mb Weather Maps

Surface Station Model

| | | | |
|-------------------------------------|---|--|---|
| Temp (F) Weather Dewpoint (F) |  | Pressure (mb) Sky Cover Wind (kts) | Data at Surface Station Temp 45 °F, dewpoint 29 °F, overcast, wind from SE at 15 knots, weather light rain, pressure 1004.5 mb |
|-------------------------------------|---|--|---|

Upper Air Station Model

| | | | |
|--------------------------|---|--------------------------|---|
| Temp (C) Dewpoint (C) |  | Height (m) Wind (kts) | Data at Pressure Level - 500 mb Temp -5 °C, dewpoint -12 °C, wind from S at 75 knots, height of level 564 <u>0</u> m |
|--------------------------|---|--------------------------|---|

Surface & 500 mb Weather Maps

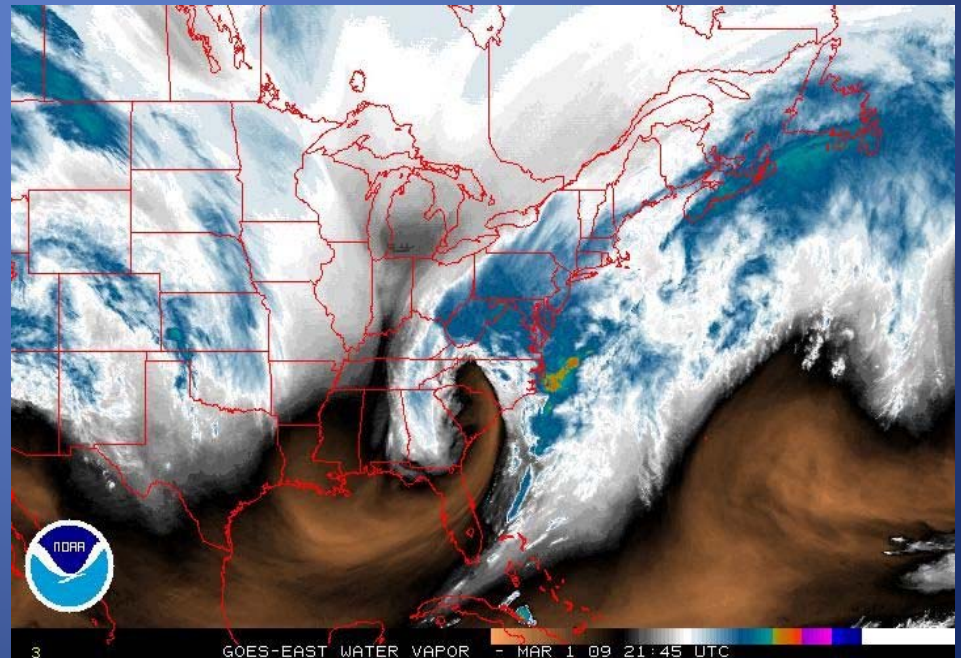
- Pressure Levels

060 = 1006.0 mb

080 = 1008.0 mb

100 = 1010.0 mb

1200 = 1020.0 mb



Weather and History

- Super Tuesday Snowstorm Primaries
- Collapse of the Ocean Ranger Oil Rig
- Inauguration Weather



The End...of the Beginning



Sky Awareness Week (April 19-25th 2009)

<http://www.weatherworks.com/skyawareness.week.html>

The End...of the Beginning



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<http://winterweather.wikispaces.com/NIST+Science+Afternoon>